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Learning from below: A micro-ethnographic account of children's self-determination as sociopolitical and intellectual action

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A B S T R A C T

This paper argues for an amplification of the everyday intellectual and political gestures of children as valuable indices and movers of learning. We identify and focus on microacts of self-determination, defined here as, "as *contestations* and *moves to elsewhere* that shift activity and dictate future status". In particular, we consider if and how such microacts that could be cast as idiosyncratic build and shape new possibilities for learning and social interaction, what we refer to here as *learning from below*. *Learning from below* reflects an effort to move beyond the binary of individual versus collective activity and to situate scholarship on social and historical movements and forms of decolonial insurgency as germane to sociocultural and interactional studies of learning. Drawing from an extensive data set which included ethnographic fieldnotes, semi-structured interviews, and over 70 hours of video data collected from an after-school community tinkering program, we found that children's everyday forms of self-determination were much more than individual acts; they emerge from social histories and carried future potentialities that shaped learning and intellectual life within the setting. This central finding is anchored in an analysis of over 600 examples, as well as two cases that look more closely at individual children's participation.

> "The minor is a continual variation on experience. It has a mobility not given to the major: its rhythms are not controlled by a preexisting structure, but open to flux. In variation is in change, indeterminate. But indeterminacy, because of its wildness, is often seen as unrigorous, flimsy, its lack of solidity mistaken for a lack of consistency. The minor thus gets cast aside, overlooked, or forgotten in the interplay of major chords…And yet the minor gesture is everywhere, all the time. Despite its precarity, it resurfaces punctually, claiming not space as such, but space of-variation. The minor invents new forms of existence, and with them, in them, we come to be. These temporary forms of life travel across the everyday, making untimely existing political structures, activating new modes of perception, inventing languages that speak in the interstices of major tongues"
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> (Manning, 2016, p. 1–2)

1. Introduction

This paper uses the lens of self-determination to amplify the minor political and intellectual gestures of children as valuable indices and movers of learning. As Manning (2016) writes, there is a subversive quality to the minor gesture, one that asserts a distinct and unpredictable identity while simultaneously intervening on the dominant frame. By virtue of their age, social status, racial, ethnic and/or class identities, children from non-dominant communities are often afforded limited access to 'major' positionings in formal educational environments. Within normative models of schooling, learning goals and social norms are typically predetermined by adults, and children (especially children of color) are often expected to assimilate. Yet, as critical sociocultural

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theorists have argued, learning "is not about offering or producing sameness, but about enabling youth to appropriate the repertoires they need in order to live the richest life possible and reach their full academic potential" (Nasir, Rosebery, Warren, & Lee, 2006). The assimilative demands of learning that produce sameness are undergirded by colonial and neoliberal values, expectations that children frequently question and trouble in everyday practice.

We argue that such forms of questioning and agency on the part of children constitute infrapolitical (Cruz, 2014; Scott, 1990; Scott, Tuck, & Yang, 2014) acts of self-determination, defined here as *contestations* and *moves to elsewhere* that shift activity and direct future socio-political and intellectual status. Such acts can be discerned at the micro level as individuals ascribed less status subtly and creatively contest social structures and hierarchies, what Kelley (1996) defines as histor*y from below*. Self-determination, by this definition, is not limited to macro assertions of freedom at the level of nations and peoples, as is typically the frame for understanding decolonial movements globally. Bringing together literature on social movements, youth resistance and agency, sociocultural theory, and psychological studies of self-determination, we argue that attuning to the relationships between children's minor gestures and the larger socio-political contexts of learning can support deeper understandings of the range of children's political actions within educational settings. This attention to the microinteractional and infrapolitical in learning prompts us to consider if/when children's efforts to contest, define or transform the domain or activity may go undetected (Cruz, 2014; Langer-Osuna, 2018; Rajala & Sannino, 2015), and when microacts of learning that may be seen as idiosyncratic or purely aesthetic build towards considerable change, what we call *learning from below*.

Drawing from an extensive data set that includes ethnographic fieldnotes, semi-structured interviews and over 70 h of video data collected from an after-school community tinkering program (The Tinkering Afterschool Program, hereafter TAP) focused on STEAM (Science, Technology, Engineering, Arts and Mathematics) learning, we ask: When and how do children exercise self-determination? What are children's micro acts of self-determination accomplishing relationally and intellectually? Borrowing from Kelley (2014), what are these everyday acts telling us (and others) about children's meaning making and subjective experiences of learning? In an effort to see the emergence of self-determination in moment-to-moment interaction we employed micro-ethnographic methods to analyze over 600 examples of self-determination. Initially, we noted the relative frequencies and qualities of instances when children engaged in *acts of contestation*: resistance to or refusal of ideas or positionings within the space. However, our analyses of self-determination were not limited to forms of negation (Motta, 2016; Warren et al., in press); we also attended to how children asserted identities and reinterpreted boundaries. We categorized these forms of self-determination as *moves to an elsewhere*: intellectual and social instances of reclaiming and reimagining the activity of learning. We offer examples of these varied forms of self-determination and contextualize them within the history and pedagogical design of the setting.

In looking closely at children's acts of contestation and moves to elsewhere, and in tracing both their geneses and subsequent responses by educators and peers, we found that children's everyday forms of self-determination are much more than individual acts; they emerge from social histories and carry future potentialities that shape learning and intellectual life within, and sometimes beyond, the setting. This central finding is anchored in a large range of examples, as well as our multidimensional analyses of two cases. Applying the lens of learning from below, we trace key moments of self-determined participation in TAP on the part of Aniyah, an African American girl who frequently demonstrated leadership and concern for the engagement and well-being of other children. On the one hand, Aniyah's efforts to assert expertise, resist deficit positionings and offer assistance to peers can be understood as personal acts of self-definition. Yet, we also found that Aniyah's participation directly reflected her interactions with educators and shaped the intellectual and social experiences of other children. A second case features Aiden, a multiethnic child who confronted deficit positionings in school but was observed as highly engaged, imaginative and confident in TAP. Aiden initiated an impromptu investigation on circuitry and temperature referred to here as the "frozen circuits" experiment. This off-script inquiry spurred rich scientific dialogue and inspired subsequent investigations from several students, opening up opportunities not only for Aiden but for others bearing witness to his project. Taken together and placed in conversation with our broader findings, these cases exemplify our understanding of children's acts of self-determination as well as their social histories and futures. Though they may appear to emanate from individual children and suggest personal processes of becoming, we attend here to the intellectual and sociopolitical re-verberations of such acts for others within the setting.

2. Multiple streams of literature

2.1. Self-determination at scale: nationhood and decolonial struggles for freedom

The language of self-determination is often evoked in relation to historical and macro-political struggles for freedom and decolonization. Though its legal meaning has shifted over the last several decades, we see the emergence of this terminology in United Nations (UN) doctrine of the mid-1900s, declaring the right of nations to be free from colonial domination (Kirgis, 1994). Place-specific, nationalist conceptualizations of self-determination are also abundant. Independent Black Institutions (IBI) in the U.S. shed the concept of individual freedom in favor of "national liberation" i.e. "black self-determination and identification with the revolutionary world" (Rickford, 2016, p. 10). Under the leadership of Salvador Allende, the working class peoples of Chile rejected "eternally subordinate status" and pursued "rapid, self-determined and independent development and the revolutionary reorganization of traditional structures" (Allende, 1972, in Cockcroft & Canning, 2000, p. 202). While the historical contexts vary, each describes the intentional, collective efforts of people to organize, resist subjugation, direct their own political status and advance cultural ways of knowing and being in society.

The tendency to associate self-determination with collectivism is therefore accurate and important. South African activist Steve Biko (1979) insisted on the crucial role of racial solidarity in dismantling Apartheid, arguing that Black citizens must, "operate as a

group in order to rid themselves of the shackles that bind them to perpetual servitude" (p. 49). Indeed, history has demonstrated the power of collective action. A longitudinal survey of civic action internationally would produce countless examples of organized efforts that succeeded in prompting large-scale change and led to peoples' emancipation from colonial rule. As many social movements have recognized, collective action aimed at liberatory outcomes also gives form to new political subjectivities and modalities of survivance (Vizenor, 1999, 2014), including the restorative bonds forged within and across communities of oppressed peoples.

2.2. Self-determination through (or in opposition to) formal education

Nations and peoples engaged in struggles for freedom have also recognized that the path to self-determination must include a reclamation of education. Rather than serving as an oppressive tool, schooling should represent the liberatory values of the collective and prepare children with the corresponding knowledge and skills. In *Education for Self-Reliance*, then-president Nyerere (1968) outlined a model of schooling designed to support the self-determination of newly-emancipated Tanzanian citizens:

> [education] must encourage the development of a proud, independent and free citizenry which relies upon itself for its own development… it is no use our educational system stressing values and knowledge appropriate to the past or to the citizens in other countries; it is wrong if it even contributes to the continuation of those inequalities and privileges which still exist in our society (p. 12).

Within the United States, scholars and practitioners have advanced complementary educational models with explicit goals of decolonization and self-determination for non-dominant groups (e.g. African-centered [Lee, 2005; Lomotey, 1992; Rickford, 2016], Chicanx-Raza Studies [Tejeda, Espinoza, & Gutiérrez, 2003; Zavala, 2018], Indigenous Studies [Bang & Marin, 2015; Grande, 2004; Tuck, 2009], Black vocational schools [Anderson, 1988, etc.]). The research documenting teaching and learning within these settings has offered invaluable insight into self-determined educational design and practice, and the specific possibilities and tensions that emerge therein.

Despite sustained efforts to advance pedagogical models that support cultural sustenance (Paris, 2012), many children of color in the U.S. do not have regular access to educational environments that uphold these values. To practice self-determination in otherwise constraining educational contexts, students sometimes employ resistance as an emancipatory tool. A sizeable body of research has explored youth resistance within traditional public schools (Fernández, 2002; Fine, 1991; Langhout, 2005; Milner, 2010). Empirical research has tended to focus on students' overt efforts to contest deficit positionings and/or behaviorally disengage from flat curricula. Students' responses are framed as localized acts of contestation tied to collective struggles for educational rights and dignity (Espinoza & Vossoughi, 2014; O'Connor, 1997). Despite these critical frameworks, in practice, student resistance is often treated as the property of the child and an indication of their individual resignation or delinquency (Nasir, 2004; Neal-Jackson, 2018). Contesting individualized frames, some scholars have offered nuanced analyses of resistance that do not contribute to students' marginalization. For example, O'Connor's (1997) study of African American high-achieving youth demonstrated how a sense of collectivism and awareness of inequities can inspire young people to resist by defying low academic expectations. Rainio (2008) also contributes a close analysis of child resistance; through educators' recognition of and willingness to negotiate classroom power dynamics, the focal student was ultimately supported and fruitfully integrated into the activity.

Thus far, we have examined self-determination as a collectivist idea advanced through organized action, and considered how education scholars have used the construct in their efforts to critically transform school curriculum and pedagogy. Focusing extensively on overt forms of student resistance, educational research has demonstrated how contestation emerges in relation to oppressive schooling experiences. Yet questions remain about the relationships between self-determination and learning, particularly around subtle forms of educational reclamation that emerge within children's everyday, moment-to-moment learning activity. An exclusive focus on collective fruits of self-determination may also obscure individual, localized meanings. We therefore turn to a discussion of micro-interactional and individualized notions of self-determination.

2.3. Psychological theories of self-determination and agency in education

Though most common in the literature on decolonial movements, the language of self-determination has also been taken up in the field of psychology. Often used synonymously with the notion of *autonomy*, Reeve (2002) defines self-determination as the "inner endorsement of one's action-the sense that an action is freely initiated and emanates from within one's self" (p. 196). Relatedly, Ryan and Deci (2000) advanced Self-Determination Theory (SDT) as a micro-theoretical framework for the study of personality and human behavior. SDT has been applied to educational settings and used to study the relationship between student engagement and teacher practice. Employing SDT, Niemiec and Ryan (2009) found that "when students' basic psychological needs for autonomy, competence, and relatedness are supported in the classroom, they are more likely to internalize their motivation to learn and to be more autonomously engaged in their studies" (p. 139). Correspondingly, scholars have argued that self-determination and students' academic achievement are supported when classroom teachers listen more and allot time for independent work. Student autonomy was also found to increase when teachers relinquished control and allowed for hands-on contact with instructional materials (Reeve, 2002).

Such psychological conceptions of self-determination are primarily concerned with individual development. Self-determination is then understood as a universal characteristic of human beings that is either supported or constrained. SDT suggests that under the right conditions, all students will demonstrate a willingness to learn content deemed important by teachers and schools. Though useful as a resource for identifying classroom practices that embolden students with a sense of their own agency, SDT does not account for socio-historical and sociopolitical contexts as motivating factors. Consequently, the construct of the "self" may be taken

for granted; humans are imagined as detached, autonomous beings responding to simple stimuli rather than conscientious, relational persons who are aware of the world and how they are positioned within it (Stetsenko, 2012, 2016). Where historical accounts of self-determination and educational resistance often situate these acts as a response to various forms of suppression, diminishment or erasure, psychological accounts of self-determination do not typically specify a political project. Also less clear from the psychological literature is if/how we might understand self-determination through a lens of fruitful contestation or deviation (e.g. "breaking away) from predetermined developmental or instructional goals (Engeström, 1996).

3. Attuning to the minor: learning and self-determination from below

Overlooking histories of self-determination that are closely tied to social transformation, educational justice and efforts to de-settle dominant epistemologies (Bang, Warren, Rosebery, & Medin, 2012), psychological perspectives generally assume mastery of normative academic content as the ultimate goal. Relatedly, student assent to what is being deliberately taught (Erickson, 1987; Erickson et al., 2008; Martin, 2016) is taken for granted as the sole index of learning. In addition to theoretical contributions that problematize narrow conceptions of selfhood (Stetsenko, 2012, 2016), a small but robust body of critical psychological research has moved beyond individualist constructs to investigate critical consciousness and other dimensions of sociopolitical development with youth inside and outside of school contexts (Hope & Spencer, 2017; Watts, Williams, & Jagers, 2003). These studies focus on psychological well-being and self-determination in social interaction, leaving open questions of disciplinary learning. They provide resources for (but themselves focus less on) understanding the ways students' may exercise self-determination and learning by questioning disciplinary norms and boundaries, adapting and infusing academic tasks and tools with their own intentions and meanings (Wertsch, 1998).

Borrowing from Calabrese Barton and Tan (2010), mainstream psychological perspectives alone offer insufficient insight into how "students use the knowledge, practice, and context of science *to develop their identities, to advance their positions in the world, and/or to alter the world toward what they envision as being more just*" (p. 195, emphasis original). The propensity to pursue social change, regardless of the context or changes sought, is not a peripheral aspect of human experience. All persons are deeply social and motivated by ideas around what it means to contribute to society (Stetsenko, 2012). For students, this includes an inclination to engage in acts that shape the sociopolitical, cultural and intellectual terrain of school. Sociocultural theorists of learning therefore offer necessary perspective and contribute frameworks for understanding domain learning as closely tied to cultural and political context and mediated through everyday interaction (Nasir et al., 2006; Nasir & Hand, 2008; Rogoff, 1994). Sociocultural perspectives also help us consider when/how young people may engage in acts that contest or expand domains and alter authority structures within classrooms (Bakhtin, 1981; Warren et al., in press).

To help illuminate the relationships between self-determination and learning, we draw from sociocultural perspectives on appropriation and agency within educational environments, and from scholarship advancing political and ethical perspectives within the learning sciences (Bang & Marin, 2015; Esmonde & Booker, 2016; Politics of Learning Writing Collective, 2017; Tzou, Bell, LaBonte, Starks, & Bang, 2019; Zavala, 2018). These perspectives recognize potential contradictions between (settled) disciplinary domains and children's everyday experiences and ways of knowing (Bang et al., 2012; Davis & Schaeffer, 2019; Gutierrez et al., 1995; Nasir et al., 2006). Here, child development encompasses wider forms of participation, to include how children engage in various forms of onto-epistemic navigation (Bang et al., 2012) and "tackle and resolve those real contradictions in the world, both intellectually and practically" (Il'enkov, 1977, as cited in Engeström, 1996). In science and inquiry-based classrooms, scholars have identified a range of mechanisms (e.g. compliance, discursive practices, rule-breaking) by which students shape activities and take ownership of their own learning (Brown, 2009; Clarke, Howley, Resnick, & Rosé, 2016; Lemke, 1990). These bodies of work recognize the significance of microinteraction while also drawing connections to broader socio-political histories.

Sociocultural studies of student agency have also begun to address the need for research and theories that better delineate the form, function and meaning of agentic behavior relative to disciplinary tasks and classroom dynamics. Martin's (2016) study describes tensions in designating student actions as either agentic or passive and alternatively, hones in on the concept of agency as an often overlooked discursive practice that can be analyzed at the micro-interactional level. While Martin's (2016) findings demonstrate how the cultivation of individual student agency is negotiated in talking with others, more insight is needed to understand how children may engage in agentic practices that have implications for the classroom collective. Furthermore, analyses of students' agentic behavior suggests a need for further attunement to the nuanced dynamics of agency and its personal meaning for students (Hilppö, Lipponen, Kumpulainen, & Virlander, 2016; Nasir & Hand, 2008; Rainio, 2008; Rajala & Sannino, 2015).

Where sociocultural theories analyze moment to moment interaction in learning environments as situated within historical and socio-political contexts, social theoretical analyses of *infrapolitics* offer a view of political critique and action as embedded within everyday activity. Anthropologist James C. Scott (1990) describes *infrapolitics* as "the circumspect struggle waged daily by subordinate groups [that] is, like infrared rays, beyond the visible end of the spectrum." For Kelley (1996) and Scott (1990), self-determination is a feature of everyday life. Across history, individuals have engaged in subtle and hard to detect forms of contestation and self-definition. In contexts where more conspicuous expressions of self-determination come with great physical, psychological and/or economic risk, people from non-dominant communities have developed strategies to minimize the threat of direct harm. Despite the seemingly mundane nature of infrapolitical acts, scholars have demonstrated their significance and transformative potential. Kelley's (1996), concept of *history from below* elaborates on this idea:

> [T]he political history of oppressed people cannot be understood without reference to infrapolitics, for these daily acts have a cumulative effect on power relations. While the meaning and effectiveness of various acts differ according to the particular

circumstances, they do make a difference, whether intended to or not (p. 8).

Kelley situates microacts that may be regarded as idiosyncratic or purely aesthetic as building towards considerable change. Whether through dress, talk, disposition or humor, oppressed people have shaped the dominant sociopolitical context.

These analyses of micro-level processes align with education research that has sought to trace the dynamics of power and resistance within everyday discourse and interaction, including forms of meaning making and learning that live under the radar (Cruz, 2014; Erickson, 2004; Gutiérrez, Larson, & Kreuter, 1995). Together, sociocultural and infrapolitical frameworks help us move beyond the binaries of macro/micro, collective/individual (Hilppö et al., 2016; Rainio, 2008) that shape the bifurcated study of self-determination in social movements and human psychology. In line with Stetsenko's (2012, 2018) analyses of personhood and societal transformation, we offer an alternative to both purely individualist accounts of self-determination and social theoretical perspectives that may gloss over the contingent nuances of individual persons and particular moments. We build on this work to examine specific ways children enact forms of self-determination within learning environments, and towards what ends, what we call *learning from below*.

4. Methodology

The tinkering After-School Program (TAP) was a partnership between a science museum and Boys & Girls Clubs serving working-class communities in a large, West Coast city. Program participants were primarily children (K-5) and young adult educators (ages 14–20) recruited from the clubs and surrounding neighborhoods. The club highlighted in this paper served African American, Central American, Chinese, Filipino/a, Mexican and Vietnamese children and families. All program staff (including researchers) were also from immigrant and/or diasporic backgrounds. Working to ground scientific and artistic practices in the developmentally-rich contexts of play and everyday activity (Vossoughi, Escudé, Kong & Hooper, 2013), TAP privileged the relational and cultural dimensions of teaching and learning. The program began with a group circle time that served as a context for community building and introducing the day's activity, followed by workshop time, where participants worked in pairs or ensembles on their projects. Elsewhere we have written in depth about TAP's pedagogical design and values (Vossoughi, Escudé, Kong & Hooper, 2013), aspects of which we refer to where relevant throughout the paper.

Over a three-year period (2011–2014), we worked with Meg Escudé[1] (TAP program director) to develop a corpus of ethnographic and interactional data, including 70 hours of video, 30 extensive fieldnotes, and interviews with 15 focal participants, as well as an initial coding scheme. Ethnographic and interactional information are particularly appropriate for ascertaining the textures and meanings of educational activity (Cazden, 1986, 2001; Erickson, 1986, 2004; McDermott & Raley, 2011), and together allowed us to look closely at salient interactions while contextualizing them in the history of events and relations within the setting. The analysis for this paper focused on aspects of the data that offer rich information on children's self-determined activity. Among other lines of inquiry germane to the larger study, our information sources were collected and crafted with the following question in mind: When and how do children enact various forms of self-determination? Our frequent use of video data to develop field notes allowed us to engage this question through detailed attention to the forms of talk and embodied action carried out by children as tied to the pedagogical and relational context within TAP.

We began our analysis by crafting analytic memos based on field notes and video recordings. In addition to allowing members of the research team who had not collected first-hand observational data to gain familiarity with the space and participants, this memoing process allowed us to begin specifying a series of codes or *phenomena of interest* that we saw as germane to micro-level acts of self-determination. These included actions such as claiming ownership, inserting playfulness, refusing help or disagreeing.

A number of criteria motivated our process of coding for acts of self-determination. First, alongside other categories such as "children's meaning making" or "STEAM practices," and in line with research on appropriation as a key marker of culturally vibrant rather than assimilative educational activity (Nasir et al., 2006), we needed a lens that would help us attune to the ways children brought their ideas, questions, histories, critiques and interests into activity not only to accomplish designed-for learning goals, but also to reshape and reimagine those goals in ways that appeared to matter to them (Rajala & Sannino, 2015; Vossoughi, 2014). This led us to pay close attention to when and how children shifted the direction of activity.

Second, genetic methodologies (Vygotsky, 1978) orient us towards learning as an emergent phenomenon that is shaped by the resources made available through local relational and intellectual histories. This genetic orientation meant that we not only aimed to identify fully formed acts of self-determination, but also the buds of self-determination and conditions that nourished processes of appropriation and self-definition among children. Hence, codes like "inserting playfulness" sensitized us to the how subtle acts of humor, performativity, linguistic play and fantastical thinking can sow conditions for reimagining and expanding the boundaries of activity. Attending to seemingly small actions on the part of children also represents our methodological effort to enact an infrapolitical lens (Cruz, 2014; Kelley, 1996, 2014) by expanding our analytic perception beyond the major chords of activity (Manning, 2016).

Finally, our reading of the literature on making and tinkering led us to see that children's pursuits of personal interests and ideas are often interpreted through the lens of "self-directed" learning (Vossoughi and Bevan, 2014). Within the constructionist frameworks that shape much of the work on making, valued forms of learning (Matusov, 1998) are often explicitly or implicitly framed as moves towards increasing independence and individual agency—an echo of the psychological theories of self-determination discussed

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[1] While all student names are pseudonyms, we name Meg here as a key partner in the work.

above. Yet our data continuously suggested that acts of self-determination often had a collective quality. Sometimes this quality was evident through the ways children's assertions of self or refusals of help prompted various forms of responsiveness and re-mediation on the part of educators—changes to the environment provoked by budding forms of self-determination. This dimension of our analysis aligns with and builds upon rich studies of pedagogical responses to students' resistant and/or unsanctioned behaviors (e.g. Gutierrez, Rymes, & Larson, 1995; Langer-Osuna, 2016; Nasir, 2004; Rainio, 2008). We also noted how children's acts of self-determination inspired peers to engage in their own extensions of off script activity or playful reinterpretations of the task, a key marker of *learning from below*. Moreover, the pedagogical framework within TAP was one that emphasized joint activity and sought to move beyond the binary of adult-centered versus child-centered models of learning (Rogoff, 1994; Vossoughi, Davis, Jackson, Echevarria, & Muñoz, Under Review). The privileging of inter-generational and relational modalities of learning within the design and research therefore prompted our efforts to recognize when and how acts of self-determination were anchored in collective histories and opened new possibilities for oneself as well as others.

Building from these criteria, the following table represents the range of ways self-determination emerged within our data (represented in Table 1, below):

Table 1
Thematic categorization of self-determination in TAP.

Category	Acts of Self-Determination (# of instances)
Moves to Elsewhere: *Acts of Claiming, Artistic Expression and/or Reimagining* **(253)**	**Claiming Ownership** (60) "I made", "This is my…" *Situating an idea, practice or object as one's own. Self-attribution by children.*
	Inserting Playfulness (56) "Ta-daa!" *Infusing an object or activity with fantasy, humor or a child's aesthetic. (e.g., word play, song, personification, performance).*
	Pursuing Personal Interests (41) "I want (to)", "I need" *Discovering, expressing and/or advancing new goals and needs within activity.*
	Going Off-Script (48) "I'm going to do/try this instead" *Moving outside the confines of an activity. (e.g., pursuit of a "wacky" idea, acts that might be interpreted as social/intellectual tangents)*
	Maintaining & Caring for Artifacts Over Time (48) "Can I keep (working on) it?", "I still have.." *Children's sustained commitment to the development or sustenance of projects and ideas.*
Acts of Contestation: *Resistance & Refusal* **(125)**	**Opting out of a Question and/or Prompt** (27) "I pass" *Instances where children choose not to accept an invitation for participation.*
	Refusing Help or Refuting Need for Help (22) "I know (how)", I don't need", "I've got it" *Assertions of capability, or wanting to do something on their own.* *Children rejecting offers of assistance.*
	Corrections or Disagreements in Discourse (15) "I disagree" *Expressing counter-perspectives; Children privileging their own thinking over consensus.*
	Other Forms of Contestation (61) *Including but not limited to moving to exclude or restrict the actions of another, questioning, ignoring requests for compliance*

(The full left-hand spanning label reads: **Self-Definition**)

Utilizing bottom-up coding (Erickson, 2004), we found that the codes identified through grounded analysis (on the right in Table 1) could be synthesized within two broader categories: *acts of contestation* (forms of resistance and refusal), and *moves to elsewhere* (claiming, reimagining and reinterpreting the boundaries of activity). Though critical discourse on youth agency tends to privilege resistance as a guiding frame, we also noted that acts of contestation (125) occurred roughly half as often as moves to elsewhere (253). These findings likely reflect the pedagogical values of the environment, which sought to engage in the everyday enactment of cultural dignity and intellectual respect. One can imagine distinct frequencies in a more constrained or rigidly organized setting. This contrast also suggests that as a field, our conceptualizations of agency may lean towards the presumption of oppressive conditions (and agency as the negation of those conditions), and ought to be further calibrated to the forms of self-determination and definition that emerge in learning environments arched towards educational possibility. This is where we ground our analysis.

At the same time, ongoing forms of contestation within TAP attune us to the subtle ways children recognized and refused deficit positionings (such as refuting the need for help) even within a more open and expansive environment. We read these refusals as windows into the need for ongoing pedagogical growth (Rainio, 2008; Rajala & Sannino, 2015), and, depending on the context, as indicators of the health of the setting. For example, when children's assertions of the right to pass or refuse to respond to a question in circle time were met with acceptance rather than discipline, we noted that other children felt license to exercise similar forms of agency over their participation.

Once we had identified the many instances represented in Table 1, we engaged in a process of secondary or "top-down" analysis (Erickson, 2004) within each code, working to identify the range of ways children claimed ownership or refuted the need for help, as well as patterns and discrepant cases within particular codes. This is where our question—what are children's acts of self-determination *accomplishing* relationally and intellectually?—became especially useful as a guide for ascertaining their specific qualities and functions in activity. To answer this question, we reviewed every coded instance of self-determination in context. We identified the events preceding and following children's acts of self-determination, asking ourselves questions such as: What idea was the child pursuing in the moment? Can we locate the genesis of this idea? If and how did this act shift the activity and/or relations in the moment? How did others respond to children's assertions (e.g. with encouragement, with a question, by taking up the idea, with a rebuttal)? What did the child do/say afterwards, on that day and on subsequent days in relation to the task? We also assessed the relative frequencies of self-determination with cross-codes that capture the affective qualities of experience, modes of affirmation and pedagogical practices (e.g. inviting, hypermediating, inquiries into students' ideas and goals). In our analytical memos, we noted patterns in action and response, both generally and for individual children. As the frequency tables within our cases will illustrate, this process also helped us to notice particular children who had many coded instances of self-determination over the course of a day (or days in succession). Our two cases (Aniyah and Aiden) are built from this strand of the analysis. For these children, we analyzed the emergence and function of their self-determined activity across multiple instances, paying close attention to days with high frequencies and to shifts over time within the data on that child. We now turn to a discussion of the findings these analytic approaches led us to develop.

5. Overview of findings

We found that children's acts of self-determination were comprised of *contestations* and *moves to elsewhere* that expanded learning and meaning-making for themselves and others. Taking up our genetic lens, we also saw that microinstances of self-determination on the part of children had social histories and futures. Acts of contestation and moves to elsewhere can shape the tenor of interaction in the moment and infuse the setting with models of possible activity. Particularly when responded to positively by educators and peers, children's self-determined activity can also enhance other children's senses of their participation rights (Smith, 2007) and the forms of self-expression that are valued within a setting. Finally, the many examples analyzed through the lenses of our codes also illustrate how such acts served to nourish children's senses of full personhood, and to claim an affinity between childhood and deep intellectual activity (Orellana, 2009; Thorne, 1987). Here too the larger socio-political histories referenced above become important to understanding the meanings of self-determination for the child—a point we take up in our two cases. Insofar as infrapolitical activity is being learned as it is being enacted, we therefore conceptualize *learning from below* as a process of individual and collective becoming (Stetsenko, 2012).

To illuminate these textures and offer a view of the patterns that contextualize our cases, we take a closer look at three phenomena traced within our coding scheme: acts of contestation, inserting playfulness, and claiming ownership. Across these examples, and in response to our second research question (What are children's micro acts of self-determination accomplishing relationally and intellectually?), we evidence the forms of witnessing and engagement that emerged in relation to children's assertions and ideas. Each of the following sections speak to how microacts of self-determination functioned as movers of learning and social relations, advancing a concept of children as full participants and visionaries in the TAP space.

5.1. Acts of contestation

In Kelley's (1996) analyses of *history from below*, people frequently deemed it necessary to "cover their tracks" to avoid persecution. Though often brief and subtle, children's acts of contestation in TAP did not appear to be coupled with routine attempts to obscure or self-correct. This observation is underscored by the infrequent cross-coding of children's contestation (125 total instances) with frustration ($n = 8$) and fear ($n = 6$). Alternatively, children's acts of contestation were most often followed by a pedagogical response that affirmed their expertise and right to expression. In line with our primary assertion regarding the social histories and futures of acts of self-determination, we argue that the routine experience of witnessing children's contestations followed by adult acceptance, clarifying questions, and in some cases, an apology can function as prolepses (Cole, 1995). Together, children and adults' actions suggested that acts of contestation need not signal the end of learning (as they might in traditional schooling contexts), but instead can open up future opportunities for unanticipated, expansive forms of relationality and meaning making (Gutiérrez et al., 1995).

Additionally, we found that contestation worked to sustain more equitable power dynamics between children and adults. Many of the coded instances of contestation were co-occurring with codes indicating a fluidity of expert/novice roles (36 instances) or pedagogical efforts to gain further insight into children's thinking (21 instances). Examples of contestation co-occurring with fluidity of expert/novice roles included several instances wherein children swiftly and publicly contested being positioned as needing help. In these instances, educators would often revise their comments and invite children to demonstrate expertise. Consider the following exchange during circle time between child Felix and Meg:

Meg continued, "Felix just asked what soldering is…". **Felix interjected, " I know what soldering is. "** Meg said, "Can you tell us then?" Felix shyly said, "Soldering? Like when you melt metal." Meg repeated this, "like when you melt metal. Do you want to add to that?"

Felix began by contesting Meg's suggestion that he needed help understanding the concept of soldering. Through the lens of self-

definition, we also see that he stood up for and affirmed his own knowledge. Meg responded to Felix with a public invitation to act in the capacity of teacher, modifying the previous positioning without chastising him for "interrupting." Perhaps noting Felix's reluctance (he covered his face and seemed shy), Meg further cemented Felix's position as knowledgeable by asking him to offer a definition. The social history between Meg and Felix, wherein they frequently worked together and had built positive rapport, potentially also helped to reinforce an understanding that Meg's question was earnest and not snide. Together, they co-constructed a scenario wherein Felix was positioned as insightful instead of lacking. The group not only benefited from Felix's explanation of soldering, but also observed an instance of a child asserting expertise that resulted in the affirmation of his ideas. Beyond the framework of resistance as disengagement in the present, we show here how children's everyday acts of contestation can also repair and shape positive intellectual and relational trajectories.

5.2. Inserting playfulness

Though acts of contestation may be intuitive markers of children's self-determination, the majority of instances identified within our data took the shape of efforts to play with, reimagine or reinterpret the boundaries of activity. While play is often treated as an accepted form of thinking and expression among children, its socio-political and transformative intellectual power (Ferholt & Lecusay, 2009; Langer-Osuna, Gargroetzi, Chavez, & Munson, 2018; Sullivan & Wilson, 2015) is less acknowledged within normative educational settings. Keeping in mind our central inquiry into what acts of self-determination *accomplish*, we found that inserting playfulness (e.g., fantasy, humor, drama, playful banter) was one of the key ways children treated the purposes and meanings of activity as malleable, built or sustained relations, and subverted distinctions between learning and joy.

In line with the value placed on epistemic heterogeneity (Rosebery, Ogonowski, DiSchino, & Warren, 2010) within the tinkering setting, we also found that a culture of multiplicity and epistemic openness supported children to take a playful attitude towards tools, materials and ideas. Almost half of the instances coded as "inserting playfulness" involved children animating materials through narrative or sound effects ($n = 22$). For example, while engaged in a light painting activity, Arthur began clicking a light on and off while saying "oooooooo, aaaaaaa." He then paused and asked Walter, a lead educator, "Can we do sound with light?" Here, the space to play created fertile ground to reimagine and expand the boundaries of activity—akin to the ways artists enact a sense of permission to make associations in an effort to think *sideways* and nurture their own creative capacities (Walter Kitundu, personal communication).

In another example with a scribbling machines activity, two girls had placed their prototypes on a large piece of butcher paper and were observing as their machines began to move, leaving squiggly designs in their wake. One of the girls, Lola, pointed excitedly to her friend's machine and said, "Yours is like that wild kid that just came running out of school, and mine is like the old grandma!" Here, Lola's public interpretation of the machine's movements blended the kinds of noticing and observation valued within STEAM learning with the playful modes of storytelling characteristic of childhood. This is one way to see how *moves to elsewhere* can assert childhood as a whole and valid (rather than incomplete) place from which to engage in engineering and artistic activity. Lola's "mine is like the old grandma" also defined the unrushed and varying movements of her own machine as fulfilling an important, respected role within the cultural world her narrative created, thus pre-empting and transforming the default understanding of a faster machine as necessarily better or smarter. This is one way in which we saw moves to elsewhere as micro-acts of self-definition, rooted in the children's efforts to author the meanings of their own activity.

Inserting playfulness also sometimes served as a way to contest an event or comment while maintaining positive social rapport, one of the few places in our data where acts of self-determination functioned akin to Kelley's (1996) discussion of "covering one's tracks." When educators had to leave one child to help another within the context of a busy making space, we would often hear exclamations like, "No, don't leave me!" (FN9, 3/17/14) or "[Anthony] traded me for [Arthur]...what's wrong with the world today!?" (FN12, 4/14/14). Children engaged in similar forms of playful banter with one another. While building a cardboard automaton with a turtle on it, Tania said, "I just kissed my turtle!" to which Felix responded, "It's like princess and a frog, but princess and a turtle." Tania shot back, "You callin me a princess?!" Though such comments likely sound familiar to anyone who spends meaningful time with children, the lens of self-determination helps us to interpret the subtle and creative ways children express their needs and desires while actively asserting preferred social positionings, i.e. checking people with love.

In line with our attention to the social geneses of children's self-determination, we also noted the ways playfulness was *designed for* within activity structures and pedagogical practice. Meg often introduced activities using multiple models, including those that were incomplete or "faulty," in order to invite a sense of multiplicity and a playfulness towards ideas and solutions. Educators also inserted their own forms of playfulness within activity. When Arthur shared with Meg that his paper circuit involved a "double battery" Meg responded by singing, "double battery, double power." Arthur chuckled and said, "and then you double the power!" Perhaps most indicative of the embracing of play within the setting, of the 56 instances of "inserting playfulness" coded within the data we found that none were reprimanded.

5.3. Claiming ownership

Inserting playfulness was one of the many ways we saw children in TA making *moves to elsewhere*. Other phenomena in this category included "claiming ownership" (60 instances) and "pursuing personal interests" (41). In and across these instances, we saw children make their own keenness and knowledgeableness visible as they claimed artifacts, practices, and identities. We saw this claiming directly in utterances such as "I've made," "mine," and "I know how to." We also saw children pursuing personal interests when they said, "I want to," "I need," "Let me," and "Can we." These moments often occurred as children were becoming more

familiar with tools and practices, as was the case with Laila as she constructed a wooden automaton.

Before hammering a nail to connect two pieces of wood for her automata box, Laila asked Walter, "Like that?" Walter responded with "It looks good," and followed up with praise for her smooth swings and the straightness of the nail as she hammered it: "Your technique is really, really good." Claiming ownership of tools and practice, Laila then declared, "I don't need any pliers or hands!" Children and facilitators often used pliers or the helping hand of a partner to hold nails in place while hammering. Laila's declaration that she no longer needed such supports illustrates how the experience of growing competence was solidified, in this case, through small but meaningful acts of public self-definition.

Later that day, Laila and Meg were drilling holes in Laila's automata box, and after Meg asked Laila about the location of the hole and positioned the drill, Laila asked, "Can I do it?" Laila and Meg proceeded to drill the hole together. In both this interaction with Meg and the prior moment with Walter, Laila played a lead role in determining the role of pedagogical assistance in her own activity, negotiating how to use tools, construct an artifact, and engage in joint activity with educators—small *acts of contestation* and *moves to elsewhere* that integrated the need for help with the substantive recognition of capability. In an interaction with a third facilitator that same day, Laila slowed down their joint effort to cut out heart shaped foam pieces for her automata and asked, "First can we design?" One might imagine scenarios where children are directed to draw and draft before cutting into materials. In this instance, even as she was nearing the completion of her project, Laila claimed a deeper interest in her artifact as she took up the practice of drafting and carefully imagining what her final product might become. Laila's efforts to shift the course of activity offer a glimpse into the ways interactional histories wherein assertions of expertise and ownership are affirmed can nourish a disposition towards pedagogical interactions as open to being shaped by children, a point we revisit in Aniyah's case.

Claiming ownership and pursuing personal interests may be interpreted as individualistic pursuits, and often in the discourses around making, independent and "personalized" learning are prevailing frames. In the instances above, however, Laila was rarely alone, and her expressions of competence and ownership were often publicly shared or negotiated with educators. Peers often witnessed these negotiations, raising questions about the ways acts of self-determination can circulate and shape settings over time. While these insights align with our central assertion about the social histories and futures of children's self-determined activity, analyzing efforts to claim ownership or pursue personal interests as established with others and situated within relations also helped us see these acts as interdependent (Markus & Kitayama, 1991) rather than autonomous.

Thus far, we have provided a sense of the range and frequencies of particular acts of self-determination and offered examples that help illuminate these patterns. While the preceding examples begin to elucidate social histories and futures of these acts through singular moments, or by tracing children's experiences across a program day, what follows are deeper looks at the meaning and evolution of two children's practices of self-determination across multiple days and instances within the setting. Both cases also consider the specific role of educators and peers in responding to students' ideas and efforts to determine the direction and shape of their learning. Taken together, these cases demonstrate how acts that may appear idiosyncratic can in fact, help to accomplish broader cultural and relational change.

6. Aniyah

The following case shows the multidimensional function of micro acts of self-determination for Aniyah, an African American girl who was eight years old when she joined TAP. Aniyah's case illustrates how self-determination in the form of contestation, claiming ownership, and inserting playfulness allowed Aniyah to define and position herself as an intellectual contributor and a resource to other children. In a world where Black girls' are too frequently typecast as being excessively assertive or contrary without cause, seeing Aniyah's everyday contestations as generative for both individual affirmation and collective support becomes especially important. Through the lens of *learning from below*, we found her often subtle attempts to resist deficit positionings and assert growing expertise as tied to an ethical responsibility to bring others along with careful assistance. Specifically, we found that Aniyah grew to help other children in ways that safeguarded their rights to contestation as reflective of her own. These findings build on existing analyses of agency and self-determination as socially constructed (Arnold & Clarke, 2014; Hilppö et al., 2016) by further specifying their communal implications for learning and social relations across multiple points in time.

6.1. Prelude

Aniyah brought an exuberance and consistent desire to share her knowledge and ideas. During circle time, Aniyah was often one of the first children to volunteer, readily expressing her opinions and insights gained from various tinkering activities. Educators in the space typically welcomed Aniyah's contributions. In the following interaction, Aniyah (with Meg's support, on the right) explained the process of making fused notebooks to program newcomers:

Aniyah:	Meg:
"Um	
you first, you have to get a baaag	*Nods, looking at Aniyah*
and then you cut it	*Another nod*, and "uh-huh"
and then you get paper	"yeah"
and then you get the ironer	*Nod*, and "uh-huh"
and you iron the paper with it."	"Uh-huh, so why do we use the iron?"

Aniyah used second person in her explanation, asserting a generalized description that built on prior experience with the activity. In turn, Meg offered both verbal and nonverbal supports as she co-authored the explanation with Aniyah.

While we found many examples in our data of educators inviting students' ideas and explanations, program staff also sometimes (due to time constraints or for pedagogical reasons) limited children's airtime. As a child inclined to speak up, Aniyah was at times asked to be patient or save her commentary for a later time. A fieldnote captured one such occurrence, which was contested by Aniyah:

> Aniyah had kept her hand raised, but Meg said, "Let's put our hands down and listen to Walter." Aniyah protested, saying that she wanted to say something. Meg said, "That's something we all do. We listen to each other until we're done talking." Aniyah rested her cheek in her hand and looked down at her other hand. *She might have felt frustrated because other kids had gotten to contribute their ideas by interjecting their voices but she, who raised her hand, did not get the same chance (?)* (FN:11/19/13).

In this instance, Aniyah appeared to contest the inequitable enforcement of a directive and advocated for her right to participate. Perhaps her sensitivity in this moment was tied to a history of feeling overlooked in school settings, or, to the expectation that TAP was to function differently by inviting (rather than constraining) the voices and ideas of children. Nonetheless, Aniyah's frustration, visible through her verbal retort and physical demeanor carried on throughout the day. While designing her segment of the chain reaction,[2] Aniyah grew impatient with a peer Arthur who was perceived as encroaching on her work space. Her interactions with Arthur, repeatedly asking him to "move back" as he observed and at one point, removing a ball from his hands that "wasn't his," seemed to follow the tenor from circle time. While we see these instances of Aniyah contesting perceived injustices as offering important insight into her individual experiences, analyses of isolated events alone leave unanswered questions about how these everyday acts build over time. Consequently, we continue with our inquiry into Aniyah's self-determined acts later in the program, zooming in on program days that included a high number of such acts on the part of Aniyah. As indicated below in Table 2, we show how during activities like wearable circuits and automata, Aniyah's increased assertions of self often served as resources for other children in the space. Table 2 outlines the instances of self-determination initiated by Aniyah that were captured by our data collection and analysis.

Table 2
Frequencies of documented acts of self-determination for Aniyah.

Aniyah *Coded Instances of SD by Activity*										
Activity	Fused Journals 11/05/13	Nature Bots (2 Days) 03/18/13 to 03/26/13	Chain Reaction (2 Days) 11/19/13 to 11/21/13	Stop Motion 12/03/13	Fused Notebooks 02/03/14	Light Painting 02/10/14	Circuit Boards 03/03/14	Wearable Circuits 03/10/14	Paper Circuits (1 Day) 03/17/14	Automata (1 day) 04/28/14
# of Instances	2	4	6	2	1	3	1	16	2	8

6.2. Modulations: shifts in positioning from disengaged to intellectual leader

Analyses of acts of self-determination initiated by Aniyah support our finding that these acts have social histories and futures. We documented several instances where Aniyah subtly resisted being positioned as inattentive or less than capable. These contestations were leveraged by educators in ways that affirmed her individual expertise and participation rights (Smith, 2007) in the setting. We see a relationship between these affirmations of Aniyah's contestations and her own processes of becoming an authority within TAP. Moreover, Aniyah's sensitivity and support for her peers' rights to contest, feel and pursue their own desired goals advanced a social future wherein these become normative and welcome modes of participation for children.

Approximately six months after the chain reaction activity, children in TAP were working on circuitry. During circle time that day, Aniyah was asked by an educator to "listen" to a peer who was sharing. At that moment Aniyah was fidgeting and not making eye contact, but may in fact have been listening to what was being said. A minute later, Aniyah's subtle contestation functioned to shift her positioning from disengaged to active contributor. Meg said aloud to another student: "And that's also like a circuit except it crosses in the middle just like you were saying you crossed your wires and it worked." Aniyah interjected, "No, that was me." Meg continued, "Sorry, Aniyah" and continued to provide instructions for the day's activity. Aniyah pointed out Meg's misattribution of her idea, a clear indication that she was listening closely (and perhaps a reminder to the group that she had a history of sharing ideas related to the task). In a quick turn, Meg apologized before moving on. Rather than seeing this moment as contestation for individual repositioning, we interpret Aniyah's actions as also having collective valance. Participants in circle time got to see Aniyah contribute to her own movement from a place of perceived disengagement to one of authority/value; Aniyah created an opportunity for Meg to acknowledge a mistake, and for other children to bear witness to this relational gesture. In this instance and others (e.g., on 02/10/14 when Aniyah ensured that new children would have an opportunity to make notebooks and then proceeded to volunteer to help Meg distribute supplies) Aniyah demonstrated that children can challenge and redirect the flow of activity. Directing activity is typically

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[2] A collective contraption (akin to "Rube Goldberg Machines") that children built using everyday materials.

reserved for adults in traditional school settings while children's subtle actions often remain part of an unsanctioned undercurrent (Gutierrez et al., 1995; Rajala & Sannino, 2015). Here, we see an example of children's self-determination functioning as a healthy nudge towards a new direction of shared social and pedagogical responsibility.

During workshop time that day, Aniyah continued to practice occupying the role of lead designer and productively troubling conventional notions of how young children should interact with adults. With the goal of creating a purple wearable circuit necklace with a heart, Aniyah began working alongside Chico, a youth educator with whom she had a longer history through the neighborhood. After bending the first wire for the pendant she said aloud, "This is a heart!...but I want a red one. Actually I want a clear one, no I want a red one, actually I want a clear one…". Responding to Aniyah's expressed design intentions, Chico pointed out a "clear" (plain) wire that was on the table. Aniyah asked Chico to get some wires for her from across the table. She then attached the heart pendant on the larger purple circle and tried it on around her neck, singing as she worked (FN: 03/10/14). After a few moments, Chico held up Aniyah's in-progress necklace so that she could strip the ends of the insulated wire. Supporting her claim of ownership over the task, he held it for her as she worked on the ends (Fig. 1). Aniyah grabbed her smaller heart pendant again and reiterated, "but I wanted to make a heart!' Chico said with a smile, "You want it to be a purple heart?" and began to help fashion the longer wire into a heart shape.
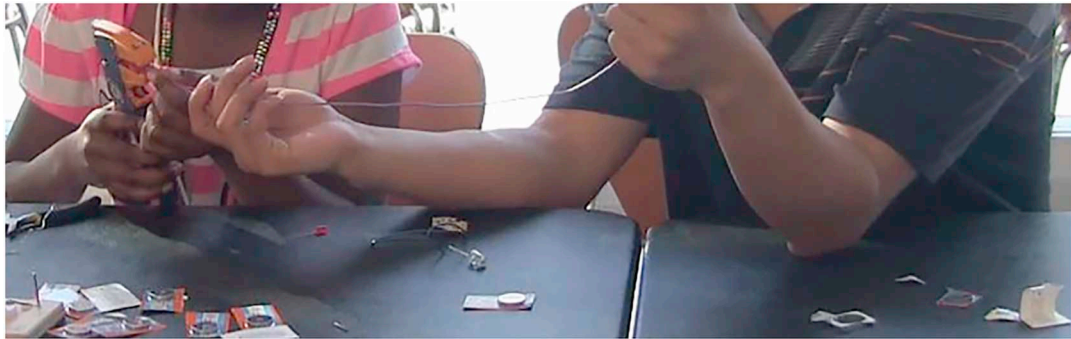

Fig. 1. Aniyah designing the heart necklace.

Across this interaction, Aniyah frequently asserted herself as the person leading the design effort. She delegated tasks to Chico and provided feedback to ensure that the final product met her aesthetic criteria. As an individual act of self-determination, Aniyah exercised agency and fulfilled her personal desire. But what meanings did such experiences of being supported in self-expression and leadership carry for Aniyah, and others? What opportunities and possible futures do these minor acts open up? As we show in the next section, Aniyah used her expertise as well as her orientation towards children's contestations as *productive* to offer support to her peers.

6.3. From minor acts to expansive participation models: Aniyah bringing others along

Aniyah's history of contestation and nourished sense of self-efficacy in TAP seemed to support patient ways of assisting other children that helped them achieve their own desired ends. Below, we offer a view into how Aniyah assisted peers who engaged in similar forms of contestation and agency in the context of receiving help. In each case, she demonstrated a skill and sensitivity to the needs of her peers.

After developing her heart necklace, Aniyah recognized peer Shauna's frustration and used narration, playfulness, and hands-on help to support Shauna in re-engaging with her circuit. Noticing that Shauna was reticent, Aniyah spoke with her casually for a moment and then offered the following instructions to help her get started selecting wires, "Ok, first thing to do…hold on…get one or two colors." Aniyah then twisted a wire around Shauna's wrist and asked her if she wanted a light. Shauna nodded and Aniyah said, "Ok, I gotta find a stripper." After leaving for a moment, Aniyah crawled back out from under the table with a battery for Shauna and said cheerfully, "Shauna, come on!", encouraging her to participate. Taking her cue from Shauna (who was still visibly downcast), Aniyah proceeded to try to create a bracelet *for* her. She kept the project in Shauna's eyesight so she could monitor her progress. Aniyah then asked Shauna what kind of light she wanted and Shauna pointed to one of the lights on the table. Across this interaction, Aniyah responded to Shauna's reticence with sustained support, and took care to ensure that her ideas were reflected in the final design—an approach similar to the one Chico had taken with her a few minutes prior.

The next month, Aniyah similarly applied her expertise around the use of glue guns to support younger peer Maxine during the automata activity. Earlier in the afternoon, Meg had helped Aniyah hot glue four wooden pieces of a box together. Later during small group time, Aniyah approached Maxine as she was using a hot glue gun to put together her own box. The interaction that commenced involved alternating moments of Aniyah's hands-on and hands-off presence and support during which Aniyah listened to and respected Maxine's efforts to maintain ownership over the project. A fieldnote entry captured the interaction:

Aniyah immediately offered to help and Maxine said something about not needing help. I noticed that Aniyah pulled back her hands at this moment but continued to stand next to Maxine and offer her support. (FN 04/28/14).

Aniyah and Maxine were negotiating what kind of support Maxine needed. Honoring Maxine's initial refusal of help, Aniyah pulled back and gave her space but maintained a watchful gaze. Maxine then asked, "Like this?" Aniyah took up Maxine's bid for additional support by re-initiating physical contact with Maxine's project (see Fig. 2). In line with our emphasis on the social histories of self-determined activity, Aniyah's help mirrored assistance she received from Meg earlier that day. All the while, Maxine maintained her position as the primary constructor of her box and continued to give cues to Aniyah about the kinds of support she did and didn't need.

Fig. 2. Aniyah supporting Maxine.

One expected (and for some, desirable) trajectory would be for children who engage in contestation to ultimately morph into enthusiastic, conforming participants. Aniyah did not seem to ascribe to this notion of conformity as ideal. Her openness and possible sensitivity to contestation as a sustained practice became a resource in her interactions with peers. Across these examples, Aniyah demonstrates how one child's assertions of expertise and self-determination can grow to involve bringing others along and helping them learn on their own terms. What may have begun as individual, seemingly small acts of self-definition begot opportunities for others to practice intellectual and social leadership.

7. Aiden

Where Aniyah's case is one of a child who frequently voiced her contestations and ideas, Aiden often enacted more quiet forms of participation. Our second case therefore illustrates how instances that could be cast as individual distraction or detachment build and yield new intellectual and relational possibilities. Below, we analyze key moments from Aiden's time in TAP.

7.1. Prelude

When Aiden was asked in his interview to compare school to TAP, he described the two as distinct. Aiden, then nine years old, explained, "cause at school they're always yelling at you and telling you to do this and that and that. Where in Tinkering, they're nice and you can just have fun." Later in the year, Aiden, who is multi-ethnic (African American and Northern European) joined in on his mother's interview as she was describing TAP and interjected in a matter-of-fact tone, "It's a lot better than school, I'll tell you that." When asked to explain, Aiden elaborated, "they let you do it like yourself. And where in school, they have a bunch of people and it's just a lot harder." Aiden's critical commentary on school is further contextualized by his history of being positioned as less engaged, despite his clear interest in science and demonstrated capacity as a problem-solver. Aiden, like many children read as quiet in school, seemed to be misunderstood and underestimated. During his early participation in TAP, Aiden seldom volunteered to speak during circle time and often opted to work alone. Within this context though, his reticence was not interpreted as evidence of individual shortcomings (Baldridge, Beck, Medina, & Reeves, 2017). The design of TAP allowed for children like Aiden to pursue personal interests and claim ownership over the materials and space. Though not always the most verbally-expressive, Aiden's ingenuity and commitment to projects were made evident in less overt ways.

Aiden's case is therefore ideal for building understanding through the lens of *learning from below*. In its subtlety, Aiden's self-determination, creativity and deep intellectual engagement could easily be overlooked. As an initial example, we harken back to Aiden's imaginative use of photographs taken to document his evolving pinball machine design. In line with the routine pedagogical practice within TAP of emphasizing the process of making and learning, Meg brought in printed photographs of various iterations of students' pinball machines. During the circle time just prior to the home-made community arcade that students were hosting for their families, Meg invited students to tape these images in their notebooks and reflect on their process. Instead, Aiden decided to affix the photos of his three iterations to his pinball machine (Fig. 3) such that they became a personal, aesthetic and functional element of his invention. Likely gleaning inspiration from Aiden, other children began to similarly integrate the photographs into their designs.

Fig. 3. Aiden's pinball machine and process photos.

When asked to recall this instance during his interview, Aiden described his intent:

To show how I started and then how I was later on, and then how I was at the end…To look back. To see what I was doing then, and what I was doing then, and then what I was doing then.

Aiden took up the spirit of Meg's invitation to reflect but transformed it from a private event in his notebook to a public expression of *process* as integral to his creation. As we show here, the pathways illuminated by children's everyday acts of self-determination become communal resources for thinking and social interaction.

7.2. Genesis: Aiden light painting

The day when children in TAP engaged in Light Painting corresponded with a shift in Aiden's participation. After this day (02/10/14), as indicated in Table 3, we noted an increase in acts of self-determination initiated by Aiden.

Table 3
Frequencies of documented acts of self-determination for Aiden.

Aiden *Coded Instances of SD by Activity*								
Activity	Pinball Machines 11/05/12	Scribble Machines 03/04/13	Fused Notebooks 02/03/14	Light Painting *(2 days)* 02/10/14	Circuit Boards 03/03/14	Wearable Circuits 03/10/14	Paper Circuits *(3 Days)* 03/17/14 to 03/31/14	Cardboard Automata *(2 days)* 04/14/14 to 04/21/14	Automata *(3 days)* 04/28/14 to 05/12/14
# of Instances	2	1	1	1	2	1	21	7	11

Aiden also opted out less and spoke more frequently during circle time. For context, Light Painting involved children manipulating handheld LEDs in a photo booth. Using strategic movement and various colored lights, participants were able to translate a paper-based design into a light painting. Hand motions with the LED tools were captured by a camera with a long exposure, offering immediate visual feedback that could then be used to inform subsequent attempts. In TAP, children worked with an educator in ensembles to actualize their light painting designs. During this activity, Aiden set out and succeeded in drawing a square, triangle and a star using two colored LEDs:

After a few additional attempts from Aiden and others, educator Walter asked if he could borrow the green LED and try something out. While Aiden stood in the booth, Walter created the following whimsical painting around him Fig. 4:

Fig. 4. Aiden crowned with LED Light.

Upon viewing the design (Fig. 4), James, a young adult educator, proclaimed, "That was awesome. King [Aiden]!" Aiden smiled in response. Later that day, we noted a second instance wherein Aiden was positioned with status by an educator, this time resulting in the elevation of his ideas. While he and two other more vocal students continued to work with Walter on light painting, Aiden's voice was waning in the sea of excitement. During a moment when Aiden's turn to take the lead was at risk of being skipped, Walter said, "I want to find out what Aiden wants to do." Aiden then said, "I want to do one by myself." Walter and the other children supported Aiden by moving out of the booth without objection.

Aiden's crowning as "king" and the ways he was supported in his expression of a desire for independence resonate as qualitatively distinct from his experiences in school. We argue that such instances, wherein children are publicly positioned as valued participants, and their minor gestures are seen, shape the social and intellectual history of the space. Such histories can enable children, like Aiden, to imagine intellectual and social futures where their ideas, even if seemingly off-script, can reign and shape the learning environment. The frozen circuits investigation, described at length below, exemplifies the ongoing practice of self-determination and becoming that can emerge in relation to this history.

7.3. The frozen circuits investigation

One month after Light Painting, the TAP group began explorations of circuitry. Aiden, who was absent during the first week, expressed during Circle Time that he needed "to learn about parallel circuits." Though parallel circuits were the focus of the week prior, Meg brought in circuit boards to encourage participants to make connections between past circuitry work and paper circuits (the present task). Aiden's assertion suggests he was concerned with developing expertise in circuits and felt comfortable verbally articulating his needs. He worked with a young adult educator to "catch up" and continued with paper circuitry with the rest of the group.

While engaging fully with the major task of the day, the following question arose for Aiden: *What happens when you put a circuit board with a lit bulb into the freezer?* The "freezer," in this instance, was an unused refrigerator in the back of the activity space with a thick coating of ice. Aiden made note of its presence and envisioned it as a possible site of experimentation, despite knowing that it was not a resource discussed or used in tinkering. Without asking permission or announcing his intention, Aiden began the investigation. Two of his peers, Tania and Clifford, noticed what Aiden was up to and joined him in observing the open freezer and lightbulb, as seen in the image below :

Aiden adjusted the board and peered in (Fig. 5). When Clifford attempted to pull the circuit board and bulb out to inspect it, Aiden

Fig. 5. Aiden initiating frozen circuits.

Fig. 6. Aiden guarding freezer door.

subtly contested by holding down his hand. Further cementing his position as leader, Aiden closed the door slowly and stood in front of it, as if guarding the newly launched experiment Fig. 6.

He then asked Shirin (TAP educator and researcher), "Can we leave it in there until next time?" Shirin suggested that he take it out for now and restart the experiment at the start of the next day when it could be monitored over time. At Shirin's prompting, Aiden removed the now "snowy" circuit board and sat it down on a nearby table. He murmured "nobody uses" the freezer.

Aiden initiated an off-script inquiry that could be read as behavioral disengagement. Instead, the lens of *learning from below* helps us to conceive of Aiden's actions as coordinating the expansion of intellectual and social possibility. Rather than become constrained by a singular task, Aiden demonstrated that he could make progress with both frozen circuits and the day's intended activity. He introduced a new model for activity that allowed him to pursue his curiosities around the relationship between temperature and electrical currents. Evidenced by his physical gestures, Aiden shifted into the role of leader and took ownership over materials and tools. When he stood in front of the freezer (Fig. 6), his posture was akin to a stance of preparedness for protest, both to maintain the integrity of the experiment and potentially protecting a creation that could be seen as off-task. Aiden vigilantly stood watch at the door to ensure that his set-up wasn't disrupted. He set and enforced physical boundaries in the space while reimagining scientific ones that allowed for an innovative use of available materials.

The next week, Aiden continued to embody leadership and commitment to the research process. While working with Chico on the primary activity, he was asked, "Are you ready to solder your lights?" Aiden did not respond directly to Chico's question and instead replied "I need to check on my experiment." This subtle act of contestation worked to foreground Aiden's personal interest in tending to his in-progress investigation, and demonstrated an understanding and commitment to scientific processes. Aiden walked over to the freezer to inspect his second attempt at the frozen circuits inquiry.

Later in the day, the frozen circuits investigation grew from one to many. The following fieldnote excerpt (03/24/14) captured the expansion of frozen circuits from Aiden's individual experiment to a shared intellectual and social endeavorFig. 7:

Following up on the frozen circuits experiment, Shirin recorded Aiden and two other children by the freezer as they engaged with the circuits. One peer had put his own circuit in on another level of the freezer. Shirin asked them what they are trying to find out and the group said, "like if it still works inside, the cold." Aiden put some ice/snow from the freezer on the battery.

Shirin then asked, "What do you guys think is gonna happen?" One child said, "the batteries are gonna die" and Aiden talked about the multiple lights he had on his level of the freezer: "Well this (pointing to one light) was as bright as this when I put it in…" (Top shelf on the left - It was now dim compared to one they had put in more recently).

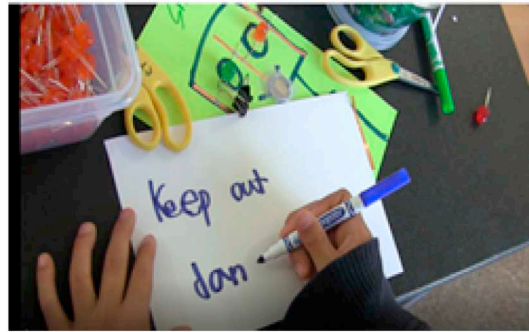**Fig. 7.** Multiple frozen circuits inquiries.

Fig. 8. Clifford's "keep out" sign for Aiden.

Where day 1 of frozen circuits demonstrated Aiden's reluctance towards outside interference, the second day indicated an openness to collaboration. Peers endorsed Aiden's concept by replicating the existing design (Fig. 7). Moreover, children's responses to Shirin's questions indicated intentionality and deep thinking about scientific phenomena. The addition of multiple circuits allotted for comparative analyses, with the newer circuit boards becoming a sort of control group. Using the more recent circuit board as a reference, Aiden articulated his observation about the change in the initial bulb's illumination over time. Like the previous day, Aiden expressed a desire to maintain the temperature of the freezer. When another curious child opened the door to inspect the experiment, Aiden said aloud, "stop checking on it!" Though the investigation had evolved to include others, Aiden maintained his role as leader, a role that went unchallenged by children in the space. As another act of solidarity and respect for Aiden, peer Clifford took time to develop and affix a "keep out, danger" sign (Fig. 8), a creative strategy for discouraging others from interrupting the in-process experiment, and one we read as further evidence of the ways individual acts of self-determination beget like activity from other children.

When asked, "what did you discover about this today?" Aiden theorized, "the light turns off after about twenty minutes....because the battery froze." When supported in following through with his unscripted inquiry, Aiden had the opportunity to participate in the social and intellectual experience of serving as lead researcher. His peers and educators also had access to this dynamic model of activity, where artifacts in the backdrop of the space became fair game for exploration. In line with research on the productiveness of seemingly off-task activity (Gutiérrez et al., 1995; Langer-Osuna, 2018), Aiden's case challenges the idea that children veering off course do so in an effort to resist teacher-determined learning goals. Aiden's self-determination did not undermine the focus on circuitry. Aiden practiced ways of being, claiming, leading, and orienting towards materials and tools not constrained by the initial activity design; and the setting responded as if the initial activity design was an invitation to explore beyond its own bounds.

How might such forms of self-determination contribute to the expansion of learning beyond the activity at hand? In addition to the collective pursuit of frozen circuits, Aiden set a precedent for designing and implementing alternative experiments using existing materials. He recognized the norm in the space where program director Meg often brought in tools from prior activities and determined that he might use these tools for an investigation of his own. Our data support the claim that other children were inspired by Aiden's off-script inquiry and consequently, enacted spin-off investigations that incorporated aspects of the frozen circuits design. Tania, who witnessed the frozen circuits experiment, later wrote this in her notebook :

Tania was documenting the scientific process in response to a question she posed about copper tape. She had placed a piece of copper tape on a table and wondered if the tape would remain intact over the weekend (Fig. 9). Her framing of the inquiry as an experiment and subsequent write-up parallels Aiden's investigative work. Like Aiden, Tania bridged normative conceptions of doing science (e.g. the stepwise scientific process) with organic experimentation aligned with her personal interests. While participating in the major activity of the day, Tania also advanced her own ideas and curiosities about the characteristics of the copper tape. Insofar as
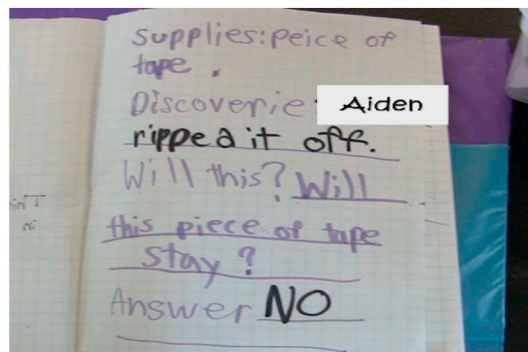

Fig. 9. Notebook entry documenting Tania's spin-off experiment.

Tania gleaned inspiration from Aiden, we see how individual acts of self-determination that become communal can beget other forms of intellectual agency.

Finally, our analyses offer insight into the dynamic relationships between home and TAP and the ways children's acts of self-determination can matter outside of the setting. We have discussed Aiden's (and others) growing sense of permission in imagining new uses for everyday materials. Yet, this orientation towards the use of tools was not isolated to sanctioned "STEAM" learning environments. Practicing in TAP reinforced such ways of being at home, and potentially more broadly. In her interview, Aiden's mom described Aiden's excitement and ingenuity in the context of a TAP musical instrument building activity, and recognized connections between home and the program setting:

> He loved, absolutely loved making the musical instruments…It was really something that he really took pride in and couldn't wait to come home and show me. And then, to take it a step further, with going into my Tupperware box, finding a rectangular Tupperware shape, putting bands on it and then showing me how, 'listen mom, this is making music, see I made my own thing like in tinkering.' I thought that was pretty funny, yet amazing. Because I thought, 'Okay, now you are applying things that you're learning here to just everyday situations which you know, before, you didn't do as much.

Aiden's mother pointed to the spilling over of ideas and dispositions, and the generative blurring of boundaries between learning contexts (Vossoughi & Gutiérrez, 2014). Attesting to a shift in Aiden's learning and self-determination, she observed her son as markedly more joyful and assertive in finding innovative uses of everyday materials. Aiden's process of learning and becoming simultaneously shaped his mother's perception of him and his experience. An act of self-determination as seemingly mundane as exploring new uses for tupperware or refrigerators mattered not only to Aiden, but also to those who love and care for him.

8. Discussion: towards an affirmation of children's elsewheres

> "*Affirmation is the yes of the child's 'again!'…It is an affirmation of the what if at the heart of the what else. Yes! does not mean 'anything goes.' The affirmative yes enjoys the stakes of the event's process, enjoys the unknowability of the operative cut that moves experience to that which cannot be known in advance*" (Manning, 2016, p. 209).

In this paper, we drew on analyses of children's interactions with materials, tools and others to examine their infrapolitical activity as intellectually and socially rich. Prior work has recognized self-determination in national and decolonial movements as giving form to new political subjectivities and helping to forge and solidify bonds within and across communities of oppressed peoples. In some cases, organized action has included efforts to reclaim schools and instill in children liberatory values, corresponding knowledge and skills. While existing scholarship has been abundantly important in demonstrating political potentialities at scale, questions remain about the relationships between self-determination and micro-genetic processes of learning, and around the subtle forms of educational reclamation that surface within children's everyday and moment-to-moment activity. This work therefore builds on extant literature, while advancing a conceptualization of self-determination that recognizes the potential of *contestation* and *moves to elsewhere* as related, mutually-constitutive practices.

Responding to calls for more precise renderings of agentic behavior (Martin, 2016; Rajala, Martin, & Kumpulainen, 2016), and the need to attune to children as social and political actors capable of shaping activity on their own behalf (Erikson et al., 2008; Goodwin, 2006; Pufall & Unsworth, 2004), this paper offered a genetic, microethnographic account of self-determination in the TAP program. Drawing from Kelley's (1996) notion of history from below, and from the work of scholars concerned with infrapolitical activity inside and outside of formal learning environments (Cruz, 2014; Langer-Osuna, 2018; Scott, 1990), our analyses and methodological approach foregrounded the "seemingly small" actions of children that fall outside major chords of activity (Manning, 2016).

Bringing together macro and micro conceptions of self-determination, we identified and analyzed a range of children's political actions within the TAP setting, centering the question of what these acts *accomplished* relationally and intellectually. To this end, we demonstrated how microacts of learning that could be cast as idiosyncratic build and shape new possibilities for learning and social interaction, what we refer to here as *learning from below*. Learning from below reflects an effort to move beyond the binary of individual versus collective activity (Rajala et al., 2016), and to situate scholarship on social and historical movements and forms of decolonial resistance and transformation as germane to interactional studies of learning. Where an application of history from below (Kelley, 1996) to the TAP setting would elevate the infrapolitical as socially and politically meaningful, *learning from below* offers additional resources for tracing the social, intellectual and developmental implications of children's self-determined activity. It also pushes against the binary of macro-collective/micro-individual to attune to the communal and collective valences within micro-instances of children's self-determination.

In Aniyah's case, history from below surfaces the sociopolitical conditions informed by her actions, e.g. a rejection of deficit positionings and the assertion of children's rights to resist. Additionally, the lens of *learning from below* calls into question the framing of her everyday acts of resistance as counterproductive to the development of domain expertise. With the support of educators, Aniyah infused the space with her spirited personality and ideas while establishing a position as knowledgeable in making. She demonstrated an agentive receptivity to the assistance she received, and modelled (both in tenor and embodied action) similar forms of support with her peers (Vossoughi, Jackson, Chen, Roldan, & Escudé, 2020). In this way, her self-determined activity became an intellectual resource for others as they gained support from a peer who honored their own efforts to receive help while asserting capability. We therefore attest here to the political and communal precedent underscored by Aniyah's participation. Aniyah affirmed (in her everyday acts of helping and expressions of criticality) the notion of children's contestation as a valuable mode of communication and connection. Our analyses of Aniyah's infrapolitical activity provide a model for research on children's self-determined

activity that does not presume disengagement or even solely individual forms of learning and self-definition as the primary (or intended) ends.

In Aiden's case, we found evidence of a gradual breaking away (Engeström, 1996) from boundaries born of schooling that typecast him as passive and saw movement towards an elsewhere of possibility. Aiden's frozen circuits investigation, emerging out of his curiosity and growing sense of permission, proceeded in tandem with the formal circuitry activities of the day. Taking into consideration Aiden's educational experiences over time, we have articulated how the freedom to engage in self-determined forms of inquiry without sanction might have affirmed Aiden and coincided with his personal processes of becoming within and beyond TAP. While these individual meanings are important, our analyses also amplify the intellectual futures legitimized through Aiden's off-script activity, where spin-off inquiries can constitute normative modes of participation in formal spaces of learning. The analytic lens of *learning from below* made visible how one child's leadership, and the affirmation of an innovative orientation towards everyday tools and materials, supported the expansion of sociopolitical and STEAM activity beyond the individual, and in Aiden's case, beyond the setting.

9. Conclusion

While we encourage the continued refinement of methodological, theoretical and practical tools to capture the depth and complexity of children's self-determined activity, we see the arguments advanced in this paper as relevant to scholars and educators in a number of ways. We conclude with a brief discussion of implications pertaining to the (1) design of liberatory learning environments, (2) pedagogical practice and (3) children's participation rights more broadly. Harkening back to Manning (2016), we offer some ideas towards practices and dispositions that support the affirmation of minor gestures and the embrace of children's efforts to move "experience to that which cannot be known in advance" (p. 209).

In light of our findings, we first argue for a shift towards increasingly flexible models of design. By flexibility, we do not mean narrow or predetermined choice (i.e. the offering of a few, circumscribed options). Rather, we argue for a design approach that is amenable to the everyday contestations, riffs and imaginings of children. Learning environments are places where children should be able to routinely practice self-determination. Often this requires adults to exercise patience and to create openings for children to question and pivot while they pursue ideas of personal and collective interest. This requires that the activities themselves also be tinkerable (Resnick & Rosenbaum, 2013; Schwartz, DiGiacomo, & Gutiérrez, 2015), and reflect a valuing of epistemic heterogeneity (Roseberry et al., 2010). As frozen circuits demonstrated, designed activities may be reimagined as fertile entry points or portals into novel activities led or co-designed by children. The concept of flexibility in design is not unique (Goulart & Roth, 2010; Jennings & Mills, 2009). However, this study suggests that a consideration of how children's everyday acts will shape the tenor and tempo of activity is integral to the design of learning environments, and tuned into the potentials for learning that lives below the surface of scripted pedagogical registers (Gutierrez et al., 1995; Gutiérrez et al., 1995).

Pedagogical perceptiveness and openness to children's assertions of self are also essential to the cultivation of justice-oriented learning environments. Here and in other work (Vossoughi, Davis, Jackson, Echevarria, & Muñoz, Under Review), we have discussed the importance of pedagogy and educators' attunement to children's ideas in making environments. Within the TAP setting, we noticed that educators routinely welcomed feedback from children, even if critical. When children contested, program staff responded thoughtfully with validation or clarifying questions but did not harp on these instances. When children forged new pathways via off-script inquiries, educators adjusted their own cadence to venture with children into the elsewheres they envisioned. There is a powerful connection here to children's participation rights (Smith, 2007), where children are granted opportunities to practice leadership and domain thinking not bound to present conditions. To this end, educators may benefit from additional support in recognizing children's subtle efforts to move towards social and intellectual elsewheres. Examples from this paper help to further specify what it might look like to be perceptive to children's minor gestures and pedagogically responsive to their power.

Finally, consistent with the lens of *learning from below* and the relationships between micro and macro scales of activity, we reiterate that children's contestations and moves to elsewhere hold meaning beyond the immediate context. Acts of self-determination can allow for children to gain experience asserting their rights to engage in learning—and in the broader society—as fully *child* and as an expert or full participant. Children trouble the presumption that their cultural ways of knowing and doing (e.g. playfulness and humor) are at odds with precise scientific inquiry. They practice fluidity and discernment in shifting from positions of learning to learned, stepping up and into roles as needed for their own and others' edification. Through minor gestures, children stake claim to their own learning and implore others to take their feelings and ideas seriously. We see great value in working to recognize these dispositions towards learning and making as akin to those that have resulted in emancipation and reclamation for non-dominant communities at scale.

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